



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>B32B 27/08, B65D 65/40, B65B 55/06</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 97/02139</b>  <b>(43) International Publication Date:</b> 23 January 1997 (23.01.97)
<b>(21) International Application Number:</b> PCT/SE96/00830 <b>(22) International Filing Date:</b> 25 June 1996 (25.06.96)  <b>(30) Priority Data:</b> 9502392-5                      3 July 1995 (03.07.95)                      SE  <b>(71) Applicant (for all designated States except US):</b> TETRA LAVAL HOLDINGS & FINANCE S.A. [CH/CH]; 70, avenue Général-Guisan, CH-1009 Pully (CH).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> MAGNUSSON, Katarina [SE/SE]; Assarhusavägen 214, S-240 17 Södra Sandby (SE). KJELGAARD, Tom [SE/SE]; Sven Tveskäggs gränd 7, S- 223 77 Lund (SE).  <b>(74) Agents:</b> STRÖM, Tore et al.; Ström & Gulliksson AB, P.O. Box 4188, S-203 13 Malmö (SE).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>
<b>(54) Title:</b> PACKAGING LAMINATE AND METHOD OF USING THE SAME  <b>(57) Abstract</b>  A laminate for manufacturing of packaging containers comprises a thermoformable base layer, a barrier layer and a laminate layer adjacent the barrier layer and directed towards the inside of the container contemplated. The base layer consists of polypropylene, foamed polypropylene, filled polypropylene, polyethylene terephthalate, filled polyethylene terephthalate, amorphous polyethylene terephthalate or filled amorphous polyethylene terephthalate, the barrier layer consists of aluminium, and an aluminium oxide coating, a silica coating, ethylene/vinyl alcohol, polyvinyl alcohol, metalized oriented polyethylene terephthalate or metalized oriented polypropylene, and the laminate layer consists of polypropylene, high density polyethylene, linear low density polyethylene, polyethylene terephthalate, amorphous polyethylene terephthalate, an adhesive plastic, a heat sealable plastic, a primer or a lacquer. Furthermore, the invention relates to a method for the manufacturing of packaging containers by means of folding of a laminate according to the invention, the laminate being subjected to autoclaving or hot filling.		

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## PACKAGING LAMINATE AND METHOD OF USING THE SAME

The present invention relates to a packaging laminate and a method of its use. More specifically the invention relates to a laminate for the manufacturing of packaging containers as well as a method for the manufacturing of a dimensional stable and impermeable packaging container by means of folding of the laminate.

The demand on a container intended for foods is that it should be easy to manufacture and handle as well as be designed and constructed in such a way that it gives the best protection possible to the products which are to be filled and transported in the container. A good product protection implies among other things that the container should be sufficiently mechanically strong and dimensional stable in order to withstand the outer influences which the container is exposed to during normal handling without the container being deformed or destroyed. Furthermore, the container should be sufficiently physically and chemically impermeable in order to prevent transport of liquid and/or gases through the walls of the container.

Several plastic materials have been extensively used as package material for foods, among other things due to their strength and since they have different permeabilities for water vapour, oxygen gas, flavouring agents, etc. However, containers manufactured of only one material seldomly have all the desired properties for a specific application. Consequently, containers of the laminate type have been more or less tailored, the different layers of the laminate being adapted to the application in question. In this connection a laminate means a material which is constructed of more than two layers joined together, the laminate - by a combination of materials with different properties - obtaining a condition which would not be achieved with one material only.

In order to be able to use the packaging laminate in containers for e.g. light sensitive products the laminate has to be supplemented with at least one additional layer of a material with barrier properties. In this connection  
5 such a barrier layer means a laminate layer with good barrier properties against light, gases and/or flavouring agents.

Known packaging laminates comprise a base layer of paper or cardbord, which gives the container strength and  
10 dimensional stability, and an outer layer of plastic, preferably polyethylene, which gives the container the necessary impermeability properties against liquid and furthermore makes the packaging laminate heat sealable in such a way that thermoplastic layers facing each other  
15 easily can be sealed by means of surface fusion with each other during the manufacturing of containers in order to form mechanically strong and liquid impermeable sealing joints.

However, the known package material has several  
20 serious drawbacks which to a large extent and sometimes completely depend on the material used as barrier layer, i.e. a material which is completely impermeable to oxygen and which also has other barrier properties valuable for the filled product, e.g. light impermeability. Such a  
25 common barrier material is a metal foil, usually a foil of aluminium (Al foil).

When containers of the type described above are manufactured the package material is often subjected to stresses which become especially great when the material is  
30 folded. This is due to the fact that the folding of a base layer having a comparatively large thickness results in that the other layers in the laminate become substantially stretched or to a corresponding extent compressed along the folding line.

When an Al foil is folded the foil can crack when very great tensile stresses are applied. The risk that this will take place during folding increases since an Al foil applied against the inside of the laminate must be covered with one or several plastic layers, usually polyethylene, in order to prevent contact between the Al foil and the later on filled foodstuff.

The known package material also has drawbacks caused by the soaking paper or cardboard layers which rapidly loose their mechanical strength properties and make the container flabby and cumbersome when it is exposed to liquid or moisture. Furthermore, the paper or cardboard layer must be made relatively thick in order to give the container a necessary dimensional rigidity, which contributes to increasing the material load and thus the risk of crack formation in the Al foil during the manufacturing of containers.

The purpose of the present invention is thus to eliminate the above mentioned drawbacks which arise when previously known packaging laminates are folded.

In order to achieve this purpose the packaging laminate according to the invention has the characterizing features of claim 1.

In order to realize said purpose a method of use according to the invention is also suggested, which method appears from claims 2 and 3.

The packaging laminate according to the invention comprises at least one thermoformable base layer, and a laminate layer arranged adjacent to the same, which laminate layer is directed towards the inside of the container contemplated.

According to the invention the packaging laminate is not composed of a usual package material of the laminate type of cardboard or paper but of a plastic material. In such a package material with a strengthening base layer of

plastic a filler can be intermixed with the plastic. Such a filler can for example consist of finely ground chalk or kaolin. Thus, the base layer can consist of polypropylene, foamed polypropylene, filled polypropylene, polyethylene  
5 terephthalate, filled polyethylene terephthalate, amorphous polyethylene terephthalate or filled amorphous polyethylene terephthalate.

The barrier layer can also consist of aluminium, an aluminium oxide coating, a silica coating, ethylene/vinyl  
10 alcohol, polyvinyl alcohol, metalized oriented polyethylene terephthalate or metalized oriented polypropylene.

The laminate layer can consist of polypropylene, high density polyethylene, linear low density polyethylene, polyethylene terephthalate, amorphous polyethylene  
15 terephthalate, an adhesive plastic, a heat sealable plastic, a primer or a lacquer.

Normally, the adhesion between the layers included in a laminate is not affected after the manufacturing of a container. On the contrary, the properties of the laminate  
20 are deteriorated during a subsequent treatment of the packaging laminate, which impairs its rigidity properties. It has thus surprisingly become apparent that in contrast to the corresponding packaging laminate according to known technique containers of a laminate according to the  
25 invention, which is folded in a first step and then is endowed its desired mechanically rigidity in a subsequent step, obtained considerably improved rigidity properties. A container manufactured from such a packaging laminate is thus due to the utilization of the total barrier optimized  
30 with reference to the barrier properties.

When converted to dimensional stable containers the packaging laminate according to the invention is subjected to folding. For this purpose the laminate as a package material in the form of a sheet or a web is folded in the  
35 same way as package materials which are constructed around

a base layer of paper or cardboard to give the container necessary strength and dimensional stability. This folding is accomplished by means of conventional packaging machines intended for such a purpose. Thus, by the base layer being plastic a folded stackable container is obtained.

After the packaging laminate has obtained its desired form by means of folding in a first step it is then in a subsequent step endowed its desired mechanical rigidity. The adhesion between the layers in the packaging laminate is thus altered during the procedure for manufacturing of the completed container. In this way a container is achieved which is impermeable to liquid and gas, i.e. it possesses good barrier properties.

The adherence can for example be accomplished by means of heat lamination of the laminate layers in the form of a premanufactured film. The adherence can also be accomplished by means of pasting or extrusion. When pasting is used the paste (dissolved in water or an organic solvent) is applied on one of the layers which then is dried and pressed against the other layer. The laminate layer can also be supplied as a film or paste in the form of the above mentioned macromolecules dissolved or dispersed in a solvent, and the solvent or the dispersing agent, respectively, is then evaporated. By the choice of material in the laminate layer and the solvent or dispersing agent, the adherence can be adapted in such a way that it becomes sufficient for the further forming of the packaging laminate to a more or less completed container. The adherence by means of pasting is preferably controlled by means of varying the velocity of the laminate web through a drying oven.

An altered adhesion between the two layers in the laminate can also be accomplished by means of extrusion, i.e. one of the layers is extruded while still being melt, if necessary by means of co-extrusion, i.e. the layers are

extruded at the same time. The procedure is well known to the skilled man in the art. In this respect the adhesion is also controlled by means of the velocity of the laminate web.

5       After the processing of the packaging laminate to the desired shape it is endowed its desired mechanical rigidity in a subsequent step by means of exposure to heat and/or pressure. The heat treatment can be accomplished by means of moist as well as dry heat. When the adherence is  
10 performed by means of pasting dry heat is preferred, and when the adherence is performed by means of extrusion moist heat is preferred, preferably by autoclaving.

      It is an advantage to form and fold a container with the desired impermeability properties for the product in  
15 question while the adherence to the laminate with a disposition to crack is low since the risk of crack formation in the packaging laminate, principally in its barrier layer, increases with increased adhesion to the laminate layer. During the subsequent step the container is  
20 locked in its final form.

      When an extrusion by means of known technique is used the procedure is adapted in such a way that the laminate layer does not reach a certain temperature which depends on the extruded component in the layer in question. This can  
25 be accomplished by means of changing the extrusion velocity and/or the extrusion temperature. The laminate layer is thus applied as a hot melted paste with rapidly binds when the layers are cold.

      When for example an adhesion plastic in the form of  
30 modified polypropylene as a laminate layer is extruded on a barrier layer of aluminium foil the extrusion is adapted in such a way that the plastic melts, only adherence being achieved. The fastening is then completed by means of raising the temperature for a varying period. At the same  
35 time a pressure can be applied on the package material, but



this is not always necessary. In this connection an autoclave is preferably used, but an oven can also be applicable.

The mechanical rigidity of the container can also be achieved in the subsequent step by an initiator integrated in one or several of the layers in the packaging laminate, preferably the base layer, the initiator being brought to initiate that chemical chain reaction which hardens the layers. Such a hardening reaction can thus be achieved by a radical initiator being present in one or several of the laminate layers. Usually, such initiators can be used without an activator or in the presence of a reduction agent. The hardening can be performed at any temperature within the interval of 0 °C to 100 °C . However, the interval 40 °C to 90 °C is adequate and preferred.

The use of the packaging laminate according to the invention gives extraordinary advantages. The laminate can by means of folding be used for the manufacturing of dimensional stable impermeable packaging containers which are very suitable for use at highly extreme conditions in a humid environment including heat treatment with moist heat at a pressure above the atmospheric. Such harsh environments comprise autoclaving at temperatures and periods customary for foodstuff. This means that the laminate is also extremely suitable to be used for the manufacturing of a container which is intended to be filled with a product under aseptic conditions. In this connection the product is sterilized and filled under almost sterile conditions in a likewise sterilized container which after fillig is sealed in such a way that the filled product before it is consumed is not reinfected by micro-organisms during storage.

When such a packaging procedure, a so called hotfill, is used the filling material is thus packed according to known technology while still being hot in sterilized,

preferably heat sterilized containers. Such a treatment results in that the container is exposed to moist heat at a temperature of 85 °C or more.

During a subsequent cooling phase containers exposed  
5 to the above mentioned example of heat treatment will also be subjected to environments in which good sealing properties of the container are required against moisture and liquid. During the cooling phase the filling material is allowed to cool in the container manufactured from a  
10 laminate. This cooling can for example take place in a fluid bath and also by means of spraying with cool water, if necessary with an accompanying cooling with CO<sub>2</sub> or N<sub>2</sub> in order to rapidly be able to achieve a sufficiently low temperature, such as 4 °C.

## CLAIMS

1. Laminate for the manufacturing of packaging  
containers, c h a r a c t e r i z e d in that the laminate  
5 comprises at least a thermoformable base layer, a barrier  
layer and adjacent to the barrier layer a laminate layer  
directed towards the inside of the container contemplated,  
the base layer consisting of a material selected from the  
group including polypropylene, foamed polypropylene, filled  
10 polypropylene, polyethylene terephtalate, filled  
polyethylene terephtalate, amorphous polyethylene  
terephtalate and filled amorphous polyethylene  
terephtalate, the barrier layer being selected from the  
group including aluminium, an aluminium oxide coating, a  
15 silica coating, ethylene/vinyl alcohol, polyvinyl alcohol,  
metalized oriented polyethylene terephtalate and metalized  
oriented polypropylene, and the laminate layer being  
selected from the group including polypropylene, high  
density polyethylene, linear low density polyethylene,  
20 polyethylene terephtalate, amorphous polyethylene  
terephtalate, an adhesive plastic, a heat sealable plastic,  
a primer and a lacquer.

2. Method for the manufacturing of a dimensional  
stable and impermeable packaging container by means of  
25 folding of a laminate as claimed in claim 1, c h a r a c t  
e r i z e d in that the laminate is subjected to  
autoclaving or hot filling.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/00830

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B32B 27/08, B65D 65/40, B65B 55/06  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B32B, B65D, B65B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

RM25, EPODOC, PAJ, WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0570222 A1 (W.R. GRACE & CO.-CONN), 18 November 1993 (18.11.93), page 4, line 6 - line 26, figure 1, abstract --	1-2
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X	EP 0414636 A1 (ALUSUISSE-LONZA SERVICES AG), 27 February 1991 (27.02.91), column 1, line 18 - line 34; column 2, line 36 - line 43; column 3, line 3 - line 43, abstract --	1-2

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

05/09/96

International application No.

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